

7.2 Compound Interest Future Value

You are earning interest on your interest !
(we say that the interest compounds.)

What you
will have
(or owe)
in the
future

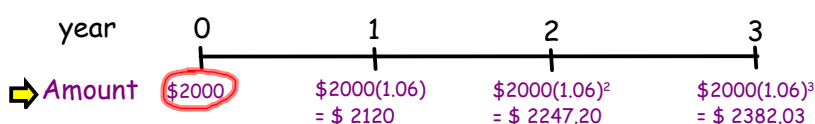
For Compound interest the interest earned is reinvested at regular intervals called compounding periods

Ex 1:

Assume Iman bought a \$2000, 3 year CSB that earned 6% compounded annually.

a) How much will she have at the end of this time?

Let's look at a time line:



b) How much interest did she earn?

$$= 2382.03 - 2000$$

$$= 382.03$$

Time lines are great but take a long time to make.
...what we need is a formula

$$A = P(1 + i)^n$$

Notice it is
exponential
growth!

⇒ A Amount in \$ at the end of the investment

i interest rate per period

$$i = \frac{\text{rate}}{\text{\# of compounding periods per year}}$$

P Principal original \$ invested or borrowed

n number of compounding periods

$$n = \text{\# of years} \times \text{\# of periods per year}$$

| Compounding Periods | # of periods per year |
|---------------------|-----------------------|
| annually | 1 |
| semi annually | 2 |
| quarterly | 4 |
| monthly | 12 |
| weekly | 52 |
| daily | 365 |



Bi weekly usually means every 2nd week
(26 times a year)

OR

Bi monthly usually means twice a month
(24 times a year)

Ex 2:

Find the amount of \$2000 investment compounded semi-annually at a rate 8%/annually, for 5 years.

$$A = P(1+i)^n$$

| # of years | Compounding type | Number of compound periods (n) | Interest per compound period (i) | Final Amount: |
|------------|--------------------|--------------------------------|----------------------------------|--|
| 3 | annually 1 | 3×1 $n = 3$ | $\frac{0.08}{1}$ $i = 0.08$ | $= 2000(1 + 0.08)^3$ $= 2519.42$ |
| 5 | semi-annually 2 | 5×2 $n = 10$ | $\frac{0.08}{2}$ | $= 2000(1 + \frac{0.08}{2})^{10}$ $= 2960.49$ |
| 7 | quarterly 4 | | | $= 3482.05$ |
| 10 | monthly 12 | | | $= 4439.28$ |

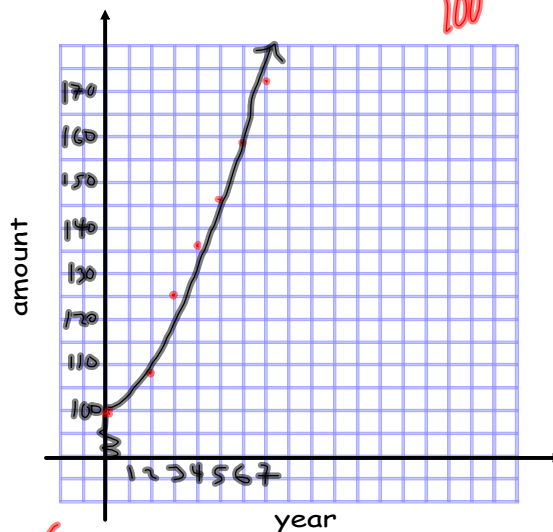
(No Rounding)

Ex 3:

A principal of \$100 is invested at 8% compounded annually for 7 years.

a) Graph the amount of investment at the end of each year.

| Year | Amount (\$) |
|------|-------------|
| 0 | 100 |
| 1 | 108 |
| 2 | 116.64 |
| 3 | 125.97 |
| 4 | 136.05 |
| 5 | 146.93 |
| 6 | 158.69 |
| 7 | 171.38 |



b) Is the growth of investment linear? Explain.

c) What is the multiplication pattern?

Ex 4:

Alexie invested \$5000 at 6% compounded annually for 17 years.

Meja invested \$5000 at 6% compounded daily for 17 years.

a) Which investment earned more money?

$$A = 5000 \left(1 + \frac{0.06}{1}\right)^{17 \times 1}$$

$$= 13463.86$$

$$A = 5000 \left(1 + \frac{0.06}{365}\right)^{6205}$$

$$= 13864.81$$

b) How much more?

∴ Meja investment
earned more money.

Home Work:

p 461

11, 12

p 468

3-5, 10 to 13, 16

